

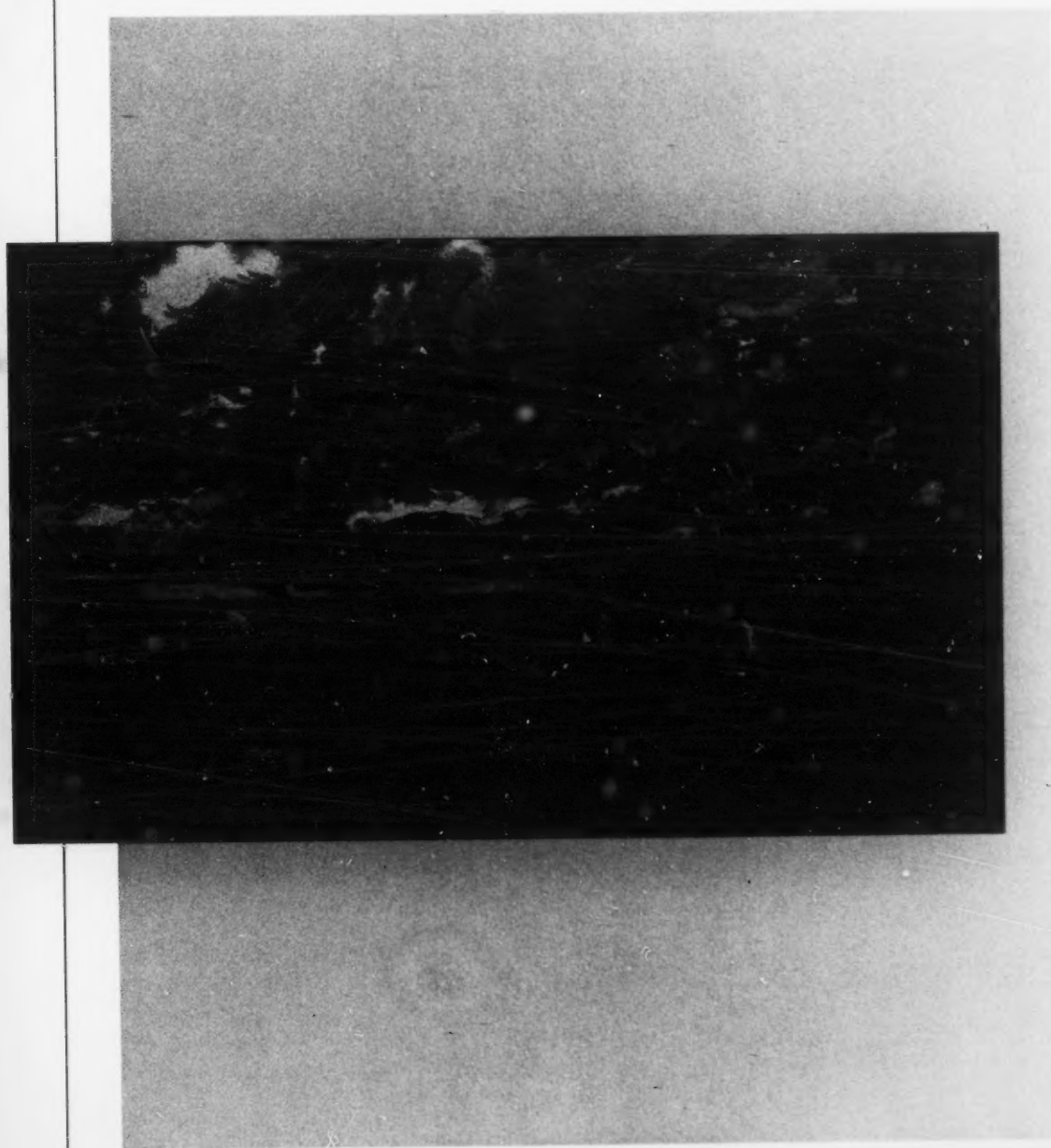
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August 1, 1992, Volume 201, Number 3

JOURNAL



OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION



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OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION



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Interpretive Summaries of Articles in This Issue 372

Letters

Freedom of Information Act does not provide full disclosure	378
Piddling wages	378

News

Concerns Facing the Profession —Ignoring business regulations can be hazardous to your practice	379
Wolf hybrids—a biological time bomb?	381
Washington Watch —Protection Act awaits vote	382
Insurance Information —Communicate to avoid malpractice claims	383
AVMA at Work —Board weighs merits of resolutions	384
Fireside Chat —Johnson bids fond farewell to presidency	386
Technicians Today —Survey: technicians underpaid	388
Student and School Scenes —Refractory epilepsy study for dogs begins	389
Under the Umbrella	389
Out and About	390
Deaths	390

Reflections . . .

Virology as the cornerstone of a memorable career—Robert A. Crandell	393
--	-----

Legal Brief

Court modifications of covenants against competition—Harold W. Hannah	400
---	-----

Reports of Original Studies

Immunogenicity and efficacy study of a commercial <i>Borrelia burgdorferi</i> bacterin—Hsien-Jue Chu, Lloyd G. Chavez, Jr., Barbara M. Blumer, Randal W. Sebring, Terri L. Wasmoe, and William M. Acree	403
Examination of Koch's postulates for <i>Borrelia burgdorferi</i> as the causative agent of limb/joint dysfunction in dogs with borreliosis—Terri L. Wasmoe, Randal W. Sebring, Barbara M. Blumer, Lloyd G. Chavez, Jr., Hsien-Jue Chu, and William M. Acree	412

Use of etretinate for treatment of primary keratinization disorders (idiopathic seborrhea) in Cocker Spaniels, West Highland White Terriers, and Basset Hounds—Helen T. Power, Peter J. Ihrke, Anthony A. Stannard, and Kathleen Q. Bachus	419
--	-----

Comparison of applanation tonometers in dogs and horses—Joan Dziezyc, Nicholas J. Millichamp, and William B. Smith	430
--	-----

Plasma concentrations of 13,14-dihydro-15-ketoprostaglandin $F_{2\alpha}$ in mares during uterine involution—P. L. Sertich and E. D. Watson	434
---	-----

Effect of repeated collection of multiple endometrial biopsy specimens on subsequent pregnancy in mares—E. D. Watson and P. L. Sertich	438
--	-----

Milk production, water consumption, and somatic cell count responses of cows subject to one to two volts of alternating current—Lee H. Southwick, David J. Wilson, and Philip M. Sears	441
--	-----

Colostrum transfer of <i>Bacteroides nodosus</i> antibodies in sheep—P. A. Bartram, J. S. Glenn, and L. L. Lassio	445
---	-----

Comparison of anthelmintic control programs for sheep in Virginia—A. M. Zajac, C. D. Thatcher, D. Notter, J. W. Hansen, and S. Umberger	449
---	-----

Clinical Reports

Resection and anastomosis for treatment of strangulating volvulus of the large colon of horses—P. L. Rose and W. M. Bradley	454
---	-----

Septic peritonitis associated with caudal myotomy in a Tennessee Walking Horse—H. David Moll and John Schumacher	458
--	-----

Laryngeal granuloma in a bull—J. C. Gamboa, K. L. Angel, R. S. Shoemaker, R. W. Kornegay, M. S. Claxton-Gill, and P. G. Hoyt	460
--	-----

Adenocarcinoma of the middle ear with osteolysis of the tympanic bulla in a cat—India F. Lane and D. Greg Hall	463
--	-----

Pancreatic adenocarcinoma with metastasis in two ferrets—Heidi L. Hofer, Aniya K. Patnaik, and Anne D. Lewis	466
--	-----

Bromide toxicosis (bromism) in a dog treated with potassium bromide for refractory seizures—Susan E. Yohn, Wallace B. Morrison, and Patrick E. Sharp	468
--	-----

Reports of Retrospective Studies

Morbidity and mortality in pups from pet stores and private sources: 968 cases (1987-1988)
David W. Hird, Randall P. Ruble, Stephen G. Reagor,
Pamila K. Cronkhite, and Michael W. Johnson 471

Nonsteroidal anti-inflammatory drug toxicosis in dogs and cats: 240 cases (1989-1990)—R. D. Jones,
R. E. Baynes, and C. T. Nimitz 475

Clinical and laboratory findings associated with actual or suspected azoospermia in dogs: 18 cases (1979-1990)—Patricia N. Olson, Patricia Schultheiss, and Howard B. Seim III 478

Complications of nasogastric intubation in horses: Nine cases (1987-1989)—Joanne Hardy, Randolph H. Stewart, Warren L. Beard, and Kathleen Yvorchuk-St-Jean 483

Review Article

Effects of sulfate in drinking water for livestock
M. Fleck Veenhuizen and G. C. Shurson 487

What Is Your Diagnosis?

Susan Ewart, Amy Williams, and Russel Stickler 493

Book Review

Equine Radiography 440
Current Therapy in Equine Medicine 3 457

New Veterinary Biological Products

..... 462

Announcements

Coming Meetings 495
Foreign Meetings 498
Applications for Membership 499
Certification Examinations 500
State Board Examinations 500
Educational Opportunities 501

Classified Ads

..... 504

INSTRUCTIONS TO AUTHORS 392

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Survey: technicians underpaid

What is the number one issue facing veterinary technicians today? What will be the most important issue facing them five years from now? It is not surprising that 74% of respondents to a national survey of veterinary technicians conducted by the North American Veterinary Technician Association (NAVTA) in 1991 (*JAVMA*, July 1, 1992, p 33) indicated low pay as the answer to both questions.

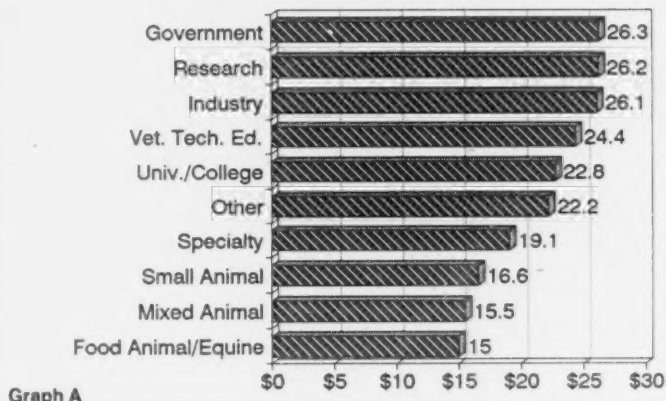
The survey was distributed to three target groups: NAVTA members for 1991, members in 1990 who did not renew in 1991, and nonmember subscribers of *Veterinary Technician*.

Graph A, which illustrates the average salary of respondents by employment type, is based on an average of seven years' employment. Salaries range widely among employment types. The highest-paying jobs currently exist in veterinary technology education, government, research, and industry. Respondents working in small animal, mixed animal, and food animal/equine practices earned less than the overall average salary for respondents. The low pay in practice settings could be one of the reasons for the increasing shortage of veterinary technicians in these areas. It appears that technicians may be seeking employment in areas providing a higher income, better benefits, and opportunity for career advancement.

Benefits

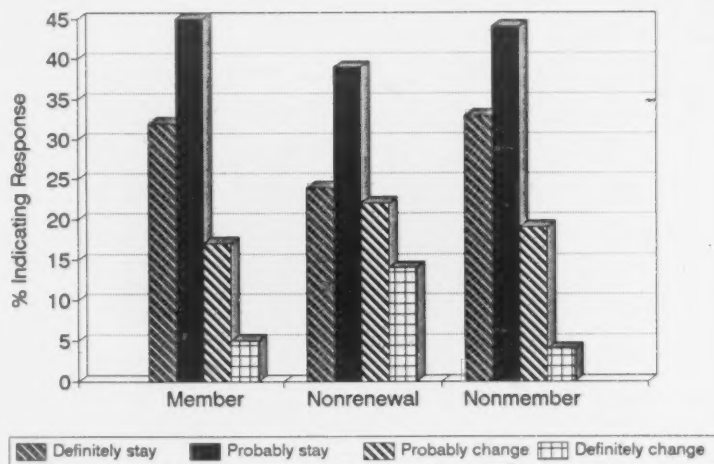
The NAVTA also surveyed respondents about the types of benefits provided by their employers. The two benefits received by the highest percentage of respondents are paid vacation (84%) and free or discounted animal care (83%). Amazingly, only 63% of respondents receive health insurance from their employer and only 57% are compensated for hours worked over 40. On the average, a large percentage of respondents do not receive benefits that many employees take for granted.

Respondents' average salaries
Values in thousands of dollars



Graph A

Career satisfaction



Career satisfaction

The low salaries and lack of employment benefits contribute directly to the career dissatisfaction of many veterinary technicians. Respondents were asked to answer the following question: "How satisfied are you with your career in veterinary technology?" Respondents were given four choices:

- I'm satisfied and will definitely stay in veterinary technology.
- I will probably stay in veterinary technology in the future.
- I will probably change to another field in the future.
- I'm dissatisfied and will definitely change to another field.

Of the 1,616 respondents in the
Continued on 389

Refractory epilepsy study on dogs begins

The Morris Animal Foundation has funded a study titled "Comparison of Combination Anticonvulsant Therapies in the Treatment of Refractory Canine Epilepsy," in the amount of \$51,600.

Directing the study at the Texas Veterinary Medical Center, Texas A&M University are Drs. Dawn Boothe and Charles Hall.

The three-year project, which

began July 1, will study potassium bromide, clorazepate, and mephentoin in combination with phenobarbital.

Case referrals will be accepted throughout the country, and a visit to Texas A&M is not necessary. Client benefits will include the cost of medication and reimbursement for up to 50% of diagnostic and monitoring costs.

"A refractory epileptic is defined in this study as a patient that is still experiencing seizures despite therapeutic serum phenobarbital concentrations, or a patient that is experiencing drug-induced hepatotoxicosis," Dr. Boothe said. "Success of the study will depend on our ability to acquire an adequate number of refractory epileptic patients."

UNDER THE UMBRELLA

Anesthesia papers invited

The American College of Veterinary Anesthesiologists has issued an invitation for abstracts for its annual scientific meeting, Oct 16, 1992 in New Orleans.

Frank Murphy, Jr, MD, diplomate of the American Board of Anesthesiology, will speak on anesthesia residency training.

All abstracts relating to anesthesia will be considered. The deadline for abstract submission will be September 1. Contact Dr. David Hodgson, Department of Clinical Sciences, College of Veterinary Medicine, Kansas State University, Manhattan, KS 66506; phone (913) 532-4258.

Correction

One of the diplomates newly certified by the American College of Veterinary Surgeons, Dr. David E. Holt, was identified incorrectly in the June 1 issue. Dr. Holt is on faculty in the Department of Clinical Studies, University of Pennsylvania School of Veterinary Medicine, Philadelphia.

Ophthalmology Society elects officers

The American Society of Veterinary Ophthalmology held its 35th annual meeting in late April during the AAHA's annual meeting in New Orleans.

One of the Society's founders

and first president, Dr. William Magrane, Osceola, Ind, was recognized by outgoing president, Dr. Harry Schadler, Columbus, Ohio.

Officers elected for 1992-1993 are Drs. Thomas Cusick, Water-

town, Mass, *president*; Mary Belle Glaze, Baton Rouge, La, *president-elect*; William Ebinger, Rochester, Mich, *Board member*; and A. J. Quinn, Stillwater, Okla, *secretary/treasurer*.

TECHNICIANS TODAY

Survey . . . from 388

three target groups, 27% indicated they may leave the field, compared with even more—36%—in the nonrenewal category.

Graph B indicates the responses given by each target group.

Of members, nonrenewals, and nonmembers, 22%, 36%, and 23%, respectively, are probably or definitely going to change to another field. Continued attrition from the working veterinary technician pool will make the technician shortage even more serious.

Summary

Respondents were asked to rate the following statement: "Veterinary technicians are so underpaid that the feasibility of staying in the profession is declining." Using graduated responses from "strongly agree" to "no opinion," more than 89% of respondents either strongly agree or agree with this statement.

The message is clear. Respondents feel that they are underpaid and that important benefits are lacking. One quarter are considering leaving the field. Meeting the challenge of solving this problem

and ensuring the continued survival and development of the veterinary health-care team will require a collective effort from veterinary and veterinary technician groups.

Written by A. Patrick Navarre, RVT, a veterinary technology instructor and operating room supervisor in the Large Animal Clinic at Purdue University in West Lafayette, Ind, and Carlene Decker, CVT, a veterinary technology instructor at Parkland College in Champaign, Ill. They are the NAVTA Task Force members responsible for implementing the grant from Hill's Pet Products to conduct this survey.

Reports of Retrospective Studies

Morbidity and mortality in pups from pet stores and private sources: 968 cases (1987-1988)

David W. Hird, DVM, PhD; Randall P. Ruble, DVM; Stephen G. Reagor, DVM; Pamila K. Cronkhite; Michael W. Johnson

Summary: Morbidity (≥ 1 disease condition) for pups sold from 3 pet stores from January 1987 through December 1988 ranged from 54 to 68%. In 1 store, morbidity was higher for store pups, compared with pups originating from private parties, for such disease conditions as "kennel cough," diarrhea, and several species of gastrointestinal parasites. In-store mortality ranged from 5 to 9.5% of pups arriving for sale.

Clients frequently ask veterinarians to recommend sources of pups. In addition, health examination of recently purchased pups is necessary, not only for welfare of the animal in terms of disease detection, treatment, and prevention, but also as a legal mechanism to protect the client's investment. It is therefore important for veterinarians to have quantitative information regarding the rates of disease conditions in pups, and to know how these rates may differ among pups purchased from various sources. There is little population-based information available.¹

The objective of the study reported here was to determine rates of disease conditions in pups from 3 franchised pet stores. We hoped that these baseline data would be useful for veterinarians, not only to monitor health of populations of pups in pet stores, but also as an aid to health evaluation of pups in clinical veterinary practices.

Materials and Methods

Health-related data were collected for pups sold from January 1987 through December 1988 from 3 northern California franchise pet stores of the same chain (stores A, B, and C), using standard

From the Department of Epidemiology and Preventive Medicine, School of Veterinary Medicine, University of California, Davis, CA. 95616 (Hird, Ruble); the Sun Valley Animal Hospital, 1130 Contra Costa Blvd, Concord, CA 94523 (Ruble); the Reagor Pet Hospital, 2513 Walnut Ave, Carmichael, CA 95608 (Reagor, Johnson); and The Sonoma Humane Society, 5465 Highway 12, Santa Rosa, CA 95401 (Cronkhite). Ms. Cronkhite's present address is Marin Humane Society, 171 Bel Marin Keys, Novato, CA 94949.

The authors thank Susan Hatch and Jan Brewer for data collation.

definitions for disease conditions. Disease rates in pups sold at 2 stores were determined from records of postpurchase veterinary examination, and in the third store by a mailed survey to purchasers. In 1 store, rates of disease conditions were compared between pups purchased from the pet store and pups obtained from private sources. In-store morbidity was determined for pups in 1 store, and mortality was obtained for pups from 2 stores. Stores B and C were studied because of reported health problems in pups. Because of this selection method, we do not know whether rates of illness or death in pups from the stores we studied were representative of those in all northern California pet stores.

Definitions of disease conditions—The following definitions were used to collect data from records. Definitions were based on clinical signs and/or laboratory test results. Treatment regimen also was recorded. Canine infectious tracheobronchitis (kennel cough) was defined as a clinical syndrome with such characteristic signs as cough in the absence of fever, and usually was treated with chloramphenicol or trimethoprim.² Diarrhea and/or vomiting were recorded if listed in the record as client history or observed by the veterinarian or animal care personnel. The term severe gastroenteritis was applied to conditions of pups with characteristic clinical signs compatible with intestinal viral infection (eg, parvovirus) including hemorrhagic gastroenteritis, fever, leukopenia ($\leq 6,000$ WBC), and usually was treated with antibiotics, antispasmodics, and fluids. All dogs in this category had hemorrhagic gastroenteritis and fever; most also had leukopenia. Tapeworm was defined as observation of proglottids by client or veterinarian. The determination of other intestinal parasites (*Giardia* spp, coccidia, *Toxocara* spp, *Ancylostoma caninum*, *Trichuris vulpis*) was based on examination of feces by flotation technique. Dermatitis was defined as characteristic clinical signs of bacterial infection, and/or typical signs of dermatomycosis accompanied by fluorescence under Wood's lamp and treatment with griseofulvin or other antifungal drug. Otitis externa was consid-

ered to be a clinical condition characterized by inflammation of the ear and presence of exudate, which was often a dark brown waxy material. Mites may or may not have been detected by microscopic examination of smear or scraping. Distemper was defined by clinical signs of fever, mucopurulent nasal and ocular discharge, anorexia, and diarrhea.

Store A—All pups arriving at store A were examined for physical defects by the contract veterinarian. Pups that subsequently died in the store before sale were taken to the contract veterinarian's clinic for disposal. Annual in-store pup mortality was defined as number of dead pups taken for disposal (numerator) divided by number of pups examined for physical defects (denominator) each year. Purchasers of pups from store A were given a certificate for a free health examination of the pup from the contract veterinarian. The certificate was valid for 14 days after purchase. Each pup examined received a complete physical examination. Fecal examination for parasites was performed only for those pups with diarrhea. Complete records were kept for each pup examined. Records of initial postpurchase health examinations (within 14 days of sale) from this contract veterinary clinic were reviewed for the contract period Jan 1, 1987 through Dec 31, 1988. Data were available only for those pups that did not subsequently become regular patients of the clinic.

Store B—Data on post purchase health examination of 6- to 20-week-old pups, purchased from pet store B, were abstracted from the records of a private multiperson veterinary clinic for the 9-month period October 1987 to June 1988. During this period, the clinic was under contract to store B to provide veterinary services. Pups purchased from this store were entitled to a free health examination at the contract veterinary clinic if brought in within 72 hours of purchase. During this same 9-month period, many newly acquired pups from sources other than store B were also examined, as part of routine (noncontract) clinic activities. All pups, regardless of source (eg, pet store, private party) were given the same thorough physical examination, including fecal examination. Complete clinical records were kept for each visit.

Data abstracted from each record included age at first examination at the clinic, source, and presence of health-related conditions. Clients were later contacted by telephone to obtain information on source of the pup if it was not listed in the clinical record. Conditions were recorded with respect to time of diagnosis after sale. For example, for pups purchased from store B, a condition first diagnosed at initial examination or within 6 days after initial examination was recorded as having developed ≤ 9 days of sale. Conditions for pups from other sources were recorded in a similar fashion.

Store C—These data pertained to pups from a

third northern California pet store, store C, and had 2 main sources: pet store records and a mailed survey to purchasers of pups.

Pet store records were obtained for the period Jan 1, 1988 through Dec 31, 1988. For each pup, information on breed, origin (breeder), date of birth, date of arrival at store, and date of sale were abstracted from store records. Reports of in-store illness and death were obtained from standardized medical history forms in each pup's file, from notes kept in daily store logs by employees, and from written communications from contract veterinarians who had examined ill pups at the store.

Post-sale health information was obtained by means of a mail survey during late December 1988 and January 1989. A standardized questionnaire (copy available from authors on request) was mailed to every person listed in the pet store files as having purchased a pup during 1988, and for whom an address was available. Data obtained included postsale health history; and date and results of postsale health examination and name of attending veterinarian. For 19 dogs, additional information (especially date of initial postpurchase examination) was obtained by subsequently contacting the veterinarians who initially examined and treated these pups. Data were reported only for conditions that developed ≤ 1 week after purchase.

Statistical analysis—The χ^2 test for independence was used to assess statistical significance.

Results

Store A—In-store mortality for pups in store A was 50/944 (5.3%) in 1987 and 52/735 (7.1%) in 1988. Postpurchase health examination data were available for 19% and 16% of pups sold from store A for 1987 and 1988, respectively. Sixty percent of 170 pups examined in 1987 and 68% of 110 pups examined in 1988 were found to have 1 or more disease condition (Table 1). Kennel cough, diarrhea, and *Giardia* spp infection were the most common conditions reported.

Store B—Records of 399 6- to 20-week-old pups were examined. Of these, 135 had been purchased from pet store B, and the remainder were obtained from other sources: private party, 207; humane society shelter, 17; other pet stores, 9; stray, 7; county animal shelter, 5; other, 1; and unknown, 18.

Rates of health-related conditions were compared between pups purchased from store B and private party-source pups (Table 2). Conditions in store-B pups were diagnosed within 9 days of sale. Over half of store-B pups had 1 or more health-related conditions, nearly twice the rate of pups obtained from private sources. Rates of kennel cough, diarrhea, and *Giardia* spp infection were higher in store-B pups, compared with pups obtained from private sources. The rate of severe gastroenteritis

Table 1—Disease conditions diagnosed during initial post-purchase examination of pups purchased at pet store A during 1987 and 1988

Condition†	1987* No. (%)‡	1988† No. (%)‡
Kennel cough	60(35.3)	46(41.8)
Dermatitis	8 (4.7)	4 (3.6)
Otitis externa	17(10.0)	18(16.4)
Diarrhea	53(31.2)	26(23.6)
Giardia infection	13(24.5)	12(46.2)
Coccidia infection	10(18.9)	3(11.5)
Toxocara infection	2 (3.8)	3(11.5)
Vomiting	16 (9.4)	5 (4.5)
One or more of above conditions	102(60.0)	75(68.2)

*170 pups examined; †110 pups examined; ‡Definitions of conditions: kennel cough, a clinical syndrome with cough in the absence of fever, usually treated with chloramphenicol or trimethoprim sulfamethoxazole; dermatitis, clinical signs of bacterial infection, and/or typical signs of dermatomycosis accompanied by fluorescence under Wood's lamp and treatment with griseofulvin or other antifungal drug; otitis externa, a clinical condition characterized by inflammation of the ear and presence of exudate, with or without presence of mites; diarrhea and/or vomiting, signs observed by client or veterinarian; Intestinal parasites (*Giardia* spp, coccidia, *Toxocara* spp, *Ancylostoma caninum*, *Trichuris vulpis*), examination of feces by flotation technique; severe gastroenteritis, characteristic clinical signs compatible with intestinal viral infection (eg, parvovirus) including hemorrhagic gastroenteritis, fever, leukopenia ($wbc \leq 6,000$), usually treated with antibiotics, antispasmodics, and fluids; tapeworm, observation of proglottids by client or veterinarian; distemper, clinical signs of fever, mucopurulent nasal and ocular discharge, anorexia, and diarrhea; §Denominators for fecal parasite rates were number of pups with diarrhea because laboratory examinations for fecal parasites were only performed for pups with diarrhea.

was higher for private-source pups, although not significantly so (0.7% vs 2.9%). Trends for conditions found within 16 days of sale were similar to those observed within 9 days of sale (data not shown).

Store C—Store-C records indicated that 346 pups were received from suppliers during 1988. Of these, 328 (94.8%) were from 3 large out-of-state suppliers, 2 (0.6%) from a California breeder, and 16 (4.6%) from unknown sources. Sixty-three (18.2%) were ≤ 8 weeks old at arrival. Of those 63, 59 (93.6%) originated from breeders outside of California. Of the remaining 4 pups ≤ 8 weeks old at arrival, 2 originated in California, and the origin for 2 was undetermined.

Proportions of the 346 pups that were recorded as having been ill during their stay in the store or that died before sale were determined (Table 3). Vomiting and/or diarrhea, severe gastroenteritis, and kennel cough were the most frequently recorded conditions. Thirty-three pups (9.5%) died before sale. Of the 63 pups that arrived at the store when they were ≤ 8 weeks old, 35 (55.6%) were reported as subsequently becoming ill, compared with 137 of 283 (48.4%) pups arriving at store when they were ≥ 8 weeks old ($P > 0.2$).

Of the approximately 200 questionnaires mailed, 115 (approx 58%) were returned (Table 4). Kennel cough and vomiting and/or diarrhea were the conditions that were reported most frequently. Nearly half (47.8%) of these pups had had 1 or more disease conditions within 7 days after purchase, and 7 (6.1%) had died because of illness first diagnosed ≤ 1 week after sale.

Table 2—Disease conditions in 6- to 20-week-old pups purchased at pet store B, compared with rates in pups obtained from private sources for conditions diagnosed within 9 days of purchase

Condition	Pet store B* No. (%)	Private source† No. (%)
Kennel cough‡	33(24.4)	4 (1.9)
Severe gastroenteritis	1 (0.7)	6 (2.9)
Diarrhea	17(12.6)	14 (6.7)
Giardia infection‡	28(20.7)	15 (7.2)
Coccidia infection‡	12 (8.9)	2 (1.0)
Toxocara infection‡	7 (5.2)	23(11.1)
<i>Ancylostoma caninum</i> infection	1 (0.7)	0 —
<i>Trichuris vulpis</i> infection	1 (0.7)	0 —
Tapeworm infection	5 (3.7)	7 (3.4)
Dermatitis	2 (1.5)	0 —
Otitis externa	1 (0.7)	3 (1.4)
Distemper	1 (0.7)	1 (0.5)
Vomiting	8 (5.9)	18 (8.7)
Died§	2 (1.5)	4 (1.9)
One or more of above conditions‡	73(54.1)	57(27.5)

*135 pups examined; †207 pups examined; ‡Difference between rates significantly different ($P \leq 0.05$); §Died of illness first observed ≤ 9 days after acquisition.

See Table 1 for definitions of conditions.

Table 3—Disease conditions observed before sale in pups received at pet store C between December 1987 and November 1988

Condition	No. (%)*
Kennel cough	15(4.3)
Severe gastroenteritis	17(4.9)
Vomiting and/or diarrhea	23(6.6)
Coccidia infection	4(1.2)
Intestinal parasites (not coccidia)	1(0.3)
Dermatitis	7(2.0)
Died in store	33(9.5)

*346 pups were examined, an individual pup may have had more than one disease condition.

See Table 1 for definitions of conditions.

Table 4—Disease conditions observed within 1 week after purchase for pups sold at pet store C between Jan 1, 1988 and Dec 31, 1988

Condition	No. (%)*
Kennel cough	21(18.3)
Severe gastroenteritis	7 (6.1)
Dermatitis	6 (5.2)
Coccidia infection	5 (4.3)
Intestinal parasites (not coccidia)	6 (5.2)
Vomiting and/or diarrhea	17(14.8)
Other condition	8 (7.0)
One or more of above conditions	55(47.8)
Died as a result of illness†	7 (6.1)

*115 pups were examined; †Illness first observed 7 days or less after sale. Primarily severe gastroenteritis.

See Table 1 for definitions of conditions.

Discussion

Previous reports of diagnoses in populations of dogs have relied on data from veterinary school hospitals, where a proportion of the patient case-load often was referral patients from private veterinary clinics.¹ In our study, morbidity and mortality were determined for pups in pet stores and for those brought in for routine physical examinations

at nonreferral veterinary clinics. We speculate that the population of pups examined in our study may have been more representative of the pet store pup population than that in other studies. However, 2 of the pet stores (B and C) were studied because of reported health problems in pups and, therefore, were not necessarily representative of stores as a whole, or even stores of the same chain. Extrapolation of our results to the population of pet store pups as a whole may not be justified. This issue could be addressed by randomly sampling pet stores, regardless of perceived health problems in pups.

In store A, health examination data were available for only a small proportion of the pups sold, and it is possible that the animals examined were not representative of all pups sold. Perhaps purchasers of ill pups were more likely to avail themselves of the free postpurchase examination, and/or were less likely to become regular clients, resulting in falsely high disease rates in our sample. Certainly not all purchasers of pups from store B brought them in for examination at the contract veterinary hospital. The proportion brought in was unknown, because the number of pups sold at store B during the study period was unavailable. It is possible that ill pups were more likely to have been brought in for examination at the contract hospital, resulting in falsely high disease rates. We also could speculate, in the store-C mailed survey, that owners of ill dogs were more likely to return the mailed questionnaire than owners of well dogs, yielding falsely high rates of disease. Recall may also have been a problem, because customers who purchased pups early in 1988 received the mailed questionnaire as long as a year after the purchase. All these factors may have adversely affected data validity.

Many outcomes in this study were clinical diagnoses (eg, diarrhea, vomiting, and death), and laboratory confirmation was not required. For other disease condition categories, laboratory diagnosis would have provided additional information, but was not possible because of the retrospective nature of the study.

In store B, the only category in which private-source pups had a significantly higher health condition rate was for *Toxocara* parasites. Most pups are infected with this parasite at birth, and the dif-

ference between the 2 groups might possibly be related to a higher treatment rate of store-B pups, compared with private-source pups. We believe that it was store policy to treat all pups for this parasite. The same may be true for the low rates of *Toxocara* spp found in pups from store A. The prevalence of *Toxocara* parasites in this study was much lower than that in the British report of 33% and 67% prevalence in treated and untreated pups, respectively.³ Prevalence of *Giardia* spp in this study approximated the 35.9% in California pups reported previously.⁴ For both parasites, methods of laboratory diagnosis differed among studies, making comparison of results difficult.

In store C, it is not known how complete and comprehensive in-store disease reporting was. However, it may be speculated that employees were not as highly trained or motivated with respect to disease recording as were employees of veterinary clinics. We believe it likely, therefore, that in-store disease conditions were underreported, and that the rates listed in Table 3 underestimated the true rates.

Rates of many disease conditions varied among pups from the 3 stores. In one instance, there was a reported outbreak of severe gastroenteritis among pups from store C, which accounted for higher rates of that condition in store-C pups. However, for other conditions, our preliminary data did not reveal whether these differences were real or were attributable to biases in the data, as previously discussed.

We recorded disease conditions as either present or absent, with no indication of severity. In future studies, it may be informative to also measure the duration and severity of such conditions as diarrhea and kennel cough as indicators of pup health.

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Nonsteroidal anti-inflammatory drug toxicosis in dogs and cats: 240 cases (1989-1990)

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Summary: A search of medical records at the Georgia Animal Poison Information Center over a 19-month period revealed 240 cases of dog and cat exposure to nonsteroidal anti-inflammatory drugs (NSAID). The most common NSAID consumed were ibuprofen, acetaminophen, aspirin, and indomethacin. The most common clinical signs of toxicosis were vomiting and diarrhea, CNS depression, and circulatory manifestations. Pets are at risk from NSAID toxicosis through administration by the owners or accidental consumption of improperly stored drugs.

Pets are at risk for developing toxicosis to pharmaceuticals through administration of the medication by owners or accidental consumption of improperly stored drugs. During a 19-month period, 98% of the calls to the Georgia Animal Poison Information Center (GAPIC) requesting information regarding nonsteroidal anti-inflammatory drug (NSAID) toxicosis in pets were associated with 4 over-the-counter medications: ibuprofen, acetaminophen, aspirin, and indomethacin. The purpose of the study reported here was to evaluate records pertaining to the consumption of NSAID by pets to determine the type and degree of exposure, and to correlate the clinical signs of intoxication with the dose and type of drug.

Criteria for Selection of Cases

Using keyword and classification query language,^a a retrospective search and analysis of written and computerized medical records of the GAPIC was conducted from Jan 1, 1989 to Aug 1, 1990. Data entry forms used by veterinary toxicologists for recording information at the GAPIC were standard Vet Tox Case Record report forms used by animal poison control centers.^b All reported cases

involving the generic compounds of the NSAID were included in this study.

The following data were compiled for each case: species, age, body weight, clinical signs, suspected NSAID, dose, time of exposure, duration of clinical signs, and source of the exposure. For purposes of analysis, pets were determined to have developed toxicosis if intake was observed of the drug and the subsequent clinical signs and time course for onset of signs were consistent with toxicosis of that drug. A case was considered "suspect" when the pet's clinical signs were consistent with toxicosis for a particular drug, but actual drug intake was not observed. A classification of "doubtful" toxicosis was made if drug intake was only suspected, and the clinical signs were inconsistent for toxicosis induced by that drug. If intake of the drug was observed, but there were no subsequent clinical signs attributable to toxicosis, the case was classified as only "exposure."

In addition, case records were evaluated as to the source or circumstances by which the pet consumed the NSAID. These were classified as "accidental" or "inappropriate" when the owner treated the animal with an incorrect dose or NSAID, or "appropriate" when the NSAID was given correctly.

Results

There were 4,588 inquiries to GAPIC for information about possible and toxicoses in dogs and cats during the 19 months. Of these, 3,545 (77.3%) were related to dogs and 1,043 (22.7%) were related to cats. The total number of calls concerning NSAID was 240 (5.2%), with 190 involving dogs (79.2%) and 50 involving cats (20.8%). The distribution of calls for the various NSAID were 120 for ibuprofen, 94 for acetaminophen, 18 for aspirin, and 8 for indomethacin.

Calls requesting assistance with suspected ibuprofen toxicosis in dogs involved 37 toxicoses, 29 suspects, 28 exposures, and 8 doubtful toxicoses according to the aforementioned classifications. Three of 240 calls were only requests for information about use of ibuprofen in dogs. Clinical signs were not observed at the time 42 of the calls were made, concerning the exposure of ibuprofen

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^aINFORMIX-4GL, Version 1.10, Informix Software, Inc, Menlo Park, Calif, 1987.

^bGAPIC Vet Tox Case Record, The Board of Trustees, University of Illinois, 1990.

Table 1—Clinical signs reported in calls regarding nonsteroidal anti-inflammatory drug toxicosis in dogs and cats

	No signs		GI		Other		Urinary		cv/Resp		Total calls	
	Dog	Cat	Dog	Cat	Dog	Cat	Dog	Cat	Dog	Cat	Dog	Cat
Ibuprofen	35	7	25	7	12	11	5	...	4	...	81	25
Acetaminophen	38	5	5	...	34	26	2	...	...	...	79	31
Aspirin	7	5	3	...	...	4	...	...	...	...	10	9
Indomethacin	2	3	1	...	...	...	...	...	...	...	3	3

No signs = no clinical signs at the time of call; GI = vomiting, diarrhea, apparent abdominal pain, and regurgitation; Other = apparent depression, weakness, cyanosis, facial edema, methemoglobinemia, lethargy, and somnolence; Urinary = pollakiuria, polyuria, cv/Resp = tachypnea, dyspnea, tachycardia, and orthopnea (.) = no clinical signs referable to this system.

in dogs and cats (Table 1). Clinical signs reported were more often related to the gastrointestinal tract (vomiting, diarrhea, hematochezia, regurgitation, and apparent abdominal pain). Clinical signs referable to the respiratory tract, urinary tract, and CNS were less common. Most of the ibuprofen exposures in dogs were accidental (86%) with inappropriate administration given as the source of exposure in only 6% of calls. Most of the cats were exposed accidentally (75%), with inappropriate administration suggested in only 19% of the calls.

The number of calls regarding acetaminophen toxicosis was 69 for dogs and 26 for cats. Clinical signs were not reported in 38 of the dogs, or in 5 of the cats (Table 1). Clinical signs referable to the gastrointestinal tract were most often seen in dogs, but in cats circulatory manifestations (cyanosis, methemoglobinemia, extreme weakness, hypothermia) were most common. Accidental ingestion of acetaminophen accounted for most (75%) of the exposures in dogs, whereas the majority of exposures in cats (56%) were inappropriate administration of the drug.

There were 10 calls regarding possible aspirin toxicosis in dogs, and 4 in cats. The predominant clinical signs in dogs were vomiting, regurgitation, whereas in cats, CNS depression was most common (Table 1). All of the toxicosis in cats were the result of inappropriate administration by owners, whereas accidental ingestion resulted in 90% of the exposures in dogs. Of the 6 calls regarding possible indomethacin toxicosis, 3 were accidental ingestions by dogs with no clinical signs at the time of the call, and 3 were about cats that were inappropriately given the drug by owners.

All reports of ibuprofen and acetaminophen toxicoses were single oral intakes, with most doses at <100 mg/kg. One dog received a single dose of 1,600 mg/kg of body weight. Cats that ingested a single dose received <200 mg/kg.

A review of the data did not reveal any relationship between age, species, breed, or sex of the animal and reports of NSAID toxicosis.

Discussion

Ibuprofen is a propionic acid derivative known to induce gastrointestinal ulceration and renal dysfunctions (acute renal failure, acute interstitial nephritis, and hyperkalemia) in human beings.^{1,2}

Renal dysfunction results from the inhibition of cyclo-oxygenase prostaglandins (PGE₂ and PGI₂), which provide for vasodilatory compensation during inadequate renal blood flow.³ Renal prostaglandins have little effect on basal renal blood flow or autoregulation, but play a major role in renal blood flow maintenance during systemic vasoconstrictor influences.⁴⁻⁶ When effective circulating volume is inadequate, the adrenergic nervous system and the renin-angiotensin system are stimulated. Angiotensin II then stimulates the production of vasodilating prostaglandins, which act locally to offset vasoconstriction and maintain renal blood flow.⁷ Although ibuprofen-associated nephropathies are often reversible after discontinuation of the drug, severe and prolonged renal hypoperfusion secondary to prostaglandin inhibition could lead to acute cortical necrosis and irreversible acute renal failure.^{3,8,9}

The inhibition of prostaglandin synthesis by NSAID via the cyclo-oxygenase pathway interferes with the maintenance of gastric mucosal integrity.^{1,10} Dogs are more predisposed than human beings to ibuprofen ulcerogenic effects because of higher gastrointestinal absorption rates and a longer drug half life, which leads to slower drug elimination and higher blood concentrations.^{9,11} These pharmacokinetic factors narrow the margin of safety for using ibuprofen in dogs. Signs of pain and inflammation may be reduced by giving 5 mg/kg/d divided into 2 doses, whereas a dosage of 8 mg/kg/d is likely to induce gastrointestinal irritation and hemorrhage.¹

Acetaminophen is a prostaglandin inhibitor known to cause Heinz body formation, methemoglobinemia, anemia, hemoglobinuria, and icterus.¹² Acetaminophen is rapidly absorbed from the gastrointestinal tract and is conjugated in most species by sulfation or glucuronidation. Because cats lack the specific glucuronyl transferase enzyme required to detoxify the reactive biotransformation metabolites of acetaminophen, these reactive metabolites bind to cellular macromolecules and can cause RBC lysis and hepatic necrosis. Cats should not be given acetaminophen at any dose, whereas clinical signs in dogs are not usually apparent until the dosage exceeds 100 mg/kg.

Aspirin, or acetylsalicylic acid, is a phenol derivative that inhibits prostaglandin synthesis by

decreasing cyclo-oxygenase activity. The main route for aspirin elimination is conjugation with either glycine or glucuronic acid. Aspirin is toxic to cats because of the cat's limited glucuronyl transferase capacity. In cats, aspirin administration may cause anorexia, signs of depression, vomiting, convulsions, hyperthermia, and death.¹³ Aspirin can be given to cats only at low doses, under certain medical conditions.^{14,15}

Indomethacin inhibits gastric mucous secretion and is strongly ulcerogenic in dogs, causing hematemesis and melena.^{10,16} Severe gastritis and duodenitis with multiple punctate erosions were found during exploratory celiotomy in a dog that was given indomethacin. Indomethacin decreases the rate of secretion of gastric mucus and the amount of carbohydrate in the mucosubstance,¹⁷ but causes no noticeable change in parietal cell population or gastric mucosal wall thickness.¹⁸ Indomethacin should not be used in dogs.¹⁵

In this study, there may have been some bias in the information collected because our samples were obtained from calls made by veterinarians and owners that were unfamiliar with specific NSAID toxicoses and treatment protocols. In some communities and veterinary clinics, there may be a greater prevalence of toxic ingestion of these over-the-counter drugs; consequently, veterinarians and pet owners may be more experienced at managing such cases and less likely to call the GAPIC. For these reasons, the data presented here may not be a true reflection of the prevalence of NSAID toxicoses in the practice environment.

Our data suggest a higher prevalence of toxicoses attributable to accidental ingestion than from therapeutic use, and that toxicoses and potential toxicoses are frequent, and pet owners should be cautioned. Indiscriminate feeding habits of dogs may have led to the large numbers of accidental ingestions and large dose exposures. The lower dose exposures in cats suggests either that cat owners are exercising more caution or that cats are more selective in feeding habits. A more accurate picture of the prevalence of toxicoses involving this

class of drugs might be obtained from a random survey of veterinary clinics.

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